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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : G06F 3/14, 15/02	A2	(11) International Publication Number: WO 98/14863
		(43) International Publication Date: 9 April 1998 (09.04.98)

(21) International Application Number: PCT/IB97/01139

(22) International Filing Date: 22 September 1997 (22.09.97)

(30) Priority Data:
9620464.9 1 October 1996 (01.10.96) GB

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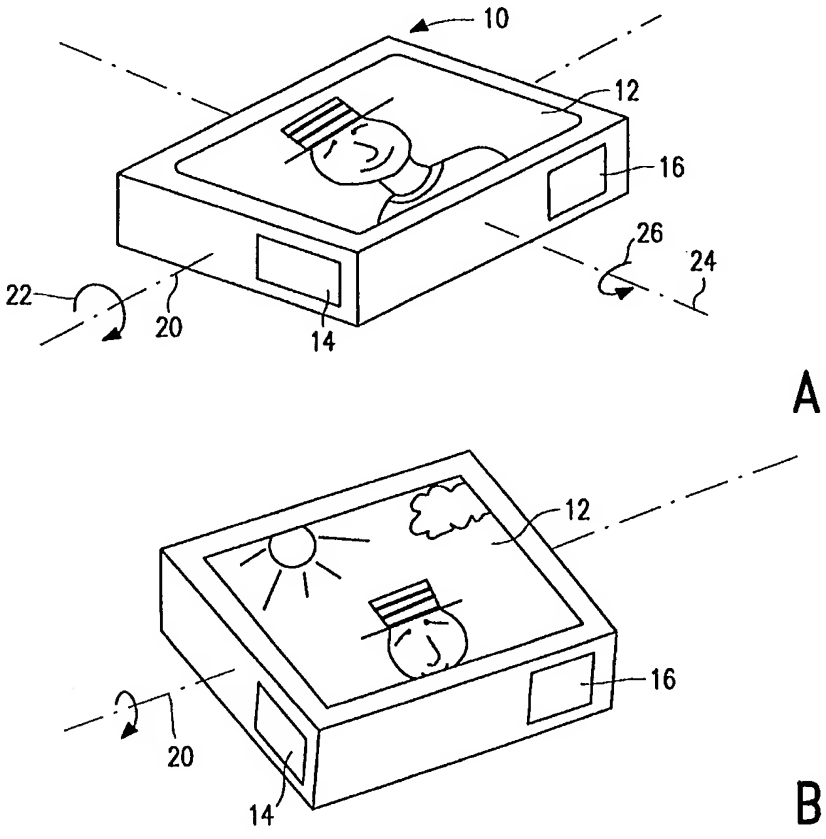
(81) Designated States: JP, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: HAND–HELD IMAGE DISPLAY DEVICE

(57) Abstract

A hand–held image display device (10) has a display (12) and at least one sensor (14, 16) responsive to an angle of tilt of the device (10). The tilt of the device is used to effect a scrolling function of the display (12).



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HAND HELD IMAGE DISPLAY DEVICE

This invention relates to a hand held image display device, such as a hand held computer or electronic diary.

It is known for conventional image display devices to include a scrolling function which enables the display device to show only a portion of an image to be viewed. This enables a magnification to be selected of the displayed portion for comfortable viewing, and the scroll function enables easy viewing of the entire image to be displayed. Conventionally, the scroll function may be implemented as horizontal and/or vertical scroll bars which may be activated using an electronic pointing device such as a mouse. Alternatively, a keyboard may be used to scroll up and down a document, or indeed from side to side.

In the case of a hand held device, additional keys may be required to enable this function to be implemented using a keyboard input, and the use of a mouse may not be possible.

According to the invention there is provided a hand held image display device having an image display means and at least one sensor which is responsive to an angle of inclination of the device, wherein the display means displays a portion of an image to be displayed, and the selection of the portion to be displayed is controlled in dependence upon the sensor signal, such that the portion to be displayed is controllable by varying the angle of inclination of the device.

In the device according to the invention, a portion of an image to be displayed is selected by tilting the device itself. This provides a natural operation for scrolling around text documents or images.

Preferably the angle of inclination comprises the angle to the horizontal of a first axis extending from the top to the bottom of the display means. In other words, it is possible to scroll up and down a document by pivoting the device about a horizontal axis extending laterally across the screen.

Similarly, the angle of inclination may comprise the angle to the horizontal of a second axis extending from one side to the other side of the display means. In this case, it is possible to scroll from side to side of a document by tilting the device left or right about an axis extending from the top to the bottom of the screen.

By using either or both of these possibilities, the impression is generated that the document displayed by the device can be rolled about within the screen until the desired portion of the image is displayed.

The sensor or sensors may comprise tilt switches so that a predetermined deviation from the horizontal gives rise to the scrolling effect. However, it is preferred that the sensor or sensors comprise force transducers which provide a variable signal depending upon the level of inclination of the device. In this way, it is possible to put into effect a control of the speed of scrolling as well as the direction.

Preferably, the device further comprises calibration means for defining a reference inclination of the device, such that at the reference inclination of the device, the portion to be displayed is constant. In this way, it is possible to ensure that the user can select a preferred operating position of the device for which the image to be displayed remains constant. Deviation from this preferred orientation of the device gives rise to the required scrolling.

The image display device may comprise a hand held data processing device, such as a telephone, personal digital organiser or game module.

The present invention will now be described by way of example, with reference to and as shown in the accompanying drawings in which:

Figure 1 shows in simplified form a device according to the invention for showing the operating principle; and

Figure 2 shows a data processing device employing a display of the present invention.

Figure 1 part A shows a hand held image display device 10 according to the invention and including a display screen 12 for displaying at least a

portion of an image to be displayed. The device 10 includes at least one tilt sensor, and two such sensors 14, 16 are shown in Figure 1, arranged orthogonally. The sensors 14, 16 each enable an angle of inclination of the device 10 to be determined which is subsequently used to control a display command which effects scrolling of the image display.

When a programme produces a quantity of data for display which is greater than can be displayed at any one time on a display device, it is conventional for a scrolling function to be provided. For example, in the case of word processing software package, horizontal and vertical scrolls may be provided enabling a user to move between portions of a document whilst maintaining sufficient clarity or size in the portion of the document displayed. The scrolling function either requires the use of a mouse, to operate on scroll bars, or requires the use of direction indicators on a keyboard.

The invention provides a more intuitive approach for image scrolling on the screen of a hand held device, wherein the whole device is tipped. For example, if the device is tipped towards the bottom of the screen the image or text displayed by the screen will "fall" down the screen. If the device is tipped towards the top of the screen, the image or text displayed will "fall" up.

As shown in Figure 1, two sensors 14, 16 may be provided, each of which is responsive to tilting of the device about a horizontal axis.

Taking the sensor 14, an axis of the sensor extends along a top-to-bottom direction of the display 12, and is therefore responsive to tilting of the device 10 about a horizontal axis 20 which extends across the display 12. Thus, the sensor 14 is responsive to rotation as represented by arrow 22 in Figure 1 part A. The sensor 14 provides the most intuitive feel for scrolling up and down a document. As shown in Figure 1 part B, when the base of the screen 12 is pivoted downwardly about the axis 20 the image displayed by the screen 12 effectively falls down as shown. In the case of a text document, the display scrolls towards the beginning of the document.

Figure 1 also represents a second sensor 16 which has an axis extending from side to side of the display 12 and is therefore responsive to rotation of the device 10 about a horizontal axis 24 extending from the top to

the bottom of the display 12. Thus, the sensor 16 is responsive to pivoting about the axis 24 as represented by arrow 26. This enables scrolling from side to side of an image displayed on the screen 12, for example where the width of an image to be displayed is greater than the width which can be displayed on the display screen at any one time.

In order to implement the invention, the controller which determines the information to be displayed must receive signals form the sensors 14, 16. The sensors may comprise conventional tilt switches which are binary devices detecting when the angle of tilt from a horizontal plane (in two directions) is greater than a predetermined level. The use of such sensors may provide limited control capability for the scroll function, since it is not possible to determine the speed at which the user wishes to scroll around the image. Of course, the use of different tilt switches each with differing sensitivity may provide a number of levels of control for the display, but the use of analogue tilt sensors is preferred. Such analogue sensors will enable proportional control to be possible, and may comprise arrangements of pressure sensors which detect the pull of gravity.

One example of such a sensor is made by the company "Analogue Devices" under the code ADXL05. This is a monolithic silicon device known as a "single chip accelerometer" having an etched substrate which deflects under the influence of gravity. This deflection alters a capacitance which is measured, and enables a steady state resolution of 0.005g.

The use of proportional tilt sensors may also enable a reference orientation of the device 10 to be established for which the displayed information is stationary, and this reference orientation need not necessarily be horizontal. It is possible, through appropriate software, to put into effect a dead zone comprising a range of orientations in which the displayed information remains constant. These orientations will then cover the normal operating position of the device by a user. Of course, if may be preferred that each user can reset the dead zone according to the situation in which the device is being used. For example, the device may be rested on a horizontal work surface in which case the dead zone will operate when the device is in a substantially

horizontal plane. Alternatively, if a user is standing while operating the device, the hand held device may be held in a nearly upright position, for example in the case of a mobile phone when the user may be scrolling between stored telephone numbers. It will be apparent to those skilled in the art that each of these commands may easily be implemented with appropriate software.

It would, of course, also be desirable to include an override function so that any unwanted scrolling may be prevented, for example, for situations when the device will not be stationary during use.

Those skilled in the art will appreciate that various software tools may be employed to improve the interface between the device 10 and the user. For example, a portion of a complete image can be displayed with the desired scale, and information may be provided around the edge of the display screen 12 which indicates to what extent the entire image extends, for example by showing a compressed version of the remainder of the image. Equally, scroll bars may be employed as position indicators , as are conventionally used in word processing packages.

The technique described with reference to Figure 1 may be applied to many different types of hand held device where there is a large amount of information to be displayed. For example, the device may comprise a personal organiser, such as represented in Figure 2, a communications device such as a pager or mobile phone or any number of other such products.

In Figure 2, the device 10 comprises a personal organiser and the display screen 12 includes scroll bars 30 representing the position of the portion displayed within the entire list of information. The specific hardware and software required to implement the invention will be appreciated by those skilled in the art. Generally speaking, the tilt sensors 14, 16 will provide input signals to a microprocessor which controls a display controller. The information to be displayed will then be modified in dependence upon the sensor signals by appropriate software implementation. The software will then enable the calibration stage referred to earlier (for providing a dead zone) to be put into effect as well as any override function which may be provided. Implementation of the invention may be carried out using conventional

apparatus, which will therefore not be described in detail in the present application.

From reading the present disclosure, other modifications will be apparent to persons skilled in the art. Such modifications may involve other features which are already known in the design and use of electrical or electronic circuits and component parts thereof and which may be used instead of or in addition to features already described herein. Although claims have been formulated in this application to particular combinations of features, it should be understood that the scope of the disclosure of the present application also includes any novel feature or any novel combination of features disclosed herein either explicitly or implicitly or any generalisation of one or more of those features which would be obvious to persons skilled in the art, whether or not it relates to the same invention as presently claimed in any claim and whether or not it mitigates any or all of the same technical problems as does the present invention. The applicants hereby give notice that new claims may be formulated to such features and/or combinations of such features during the prosecution of the present application or of any further application derived therefrom.

CLAIMS

1. A hand-held image display device having an image display means and at least one sensor which is responsive to an angle of inclination of the device, wherein the display means displays a portion of an image to be displayed, and the selection of the portion to be displayed is controlled in dependence upon the sensor signal, such that the portion to be displayed is controllable by varying the angle of inclination of the device.

2. A hand-held image display device as claimed in claim 1, wherein the angle of inclination comprises the angle to the horizontal of a first axis extending from the top to the bottom of the display means.

3. A hand-held image display device as claimed in claim 1, wherein the angle of inclination comprises the angle to the horizontal of a second axis extending from one side to the other side of the display means.

4. A hand-held image display device as claimed in claim 1, comprising two sensors, one of which is responsive to the angle to the horizontal of a first axis extending from the top to the bottom of the display means, and the other of which is responsive to the angle to the horizontal of a second axis extending from one side to the other side of the display means.

5. A hand-held image display device as claimed in any preceding claim, wherein the sensor or sensors comprise tilt switches.

6. A hand-held image display device as claimed in any one of claims 1 to 4, wherein the sensor or sensors comprise force transducers which provide a variable signal depending upon the level of inclination of the device.

7. A hand-held image display device as claimed in claim 6, wherein the device further comprises calibration means for defining a reference

inclination of the device, such that at the reference inclination of the device, the portion to be displayed is constant.

8. A hand-held image display device as claimed in any preceding claim, comprising a hand-held data processing device.

1/1

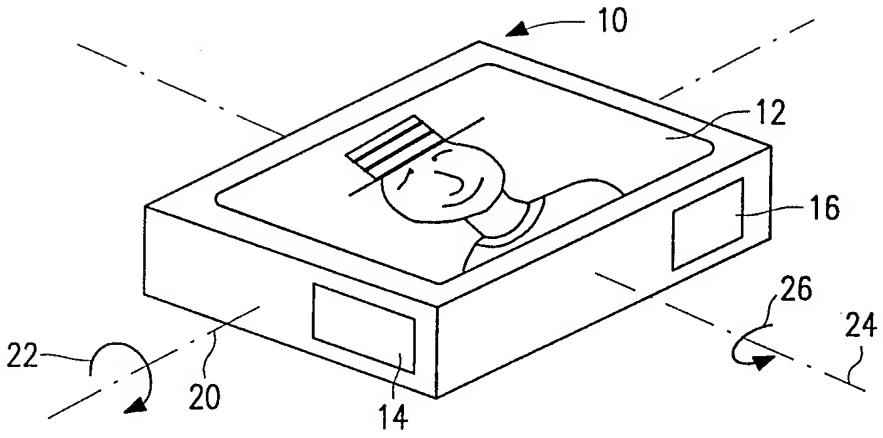

FIG. 1A

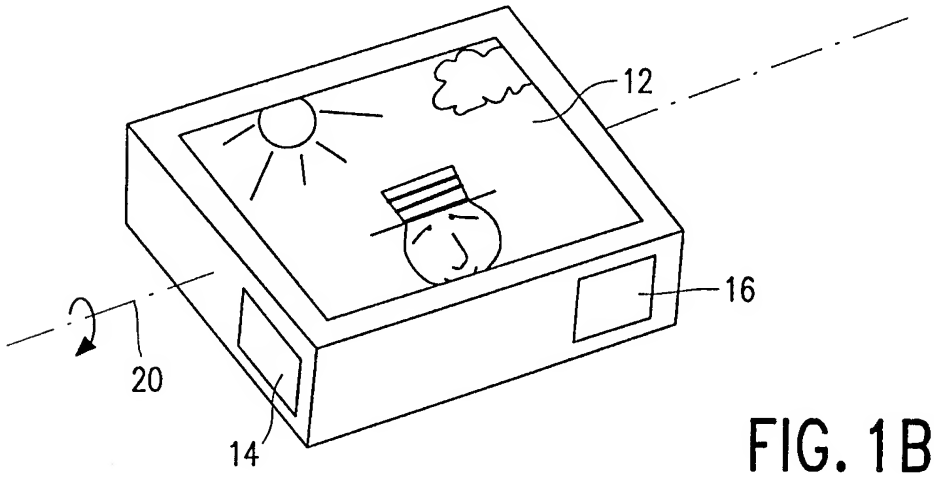

FIG. 1B

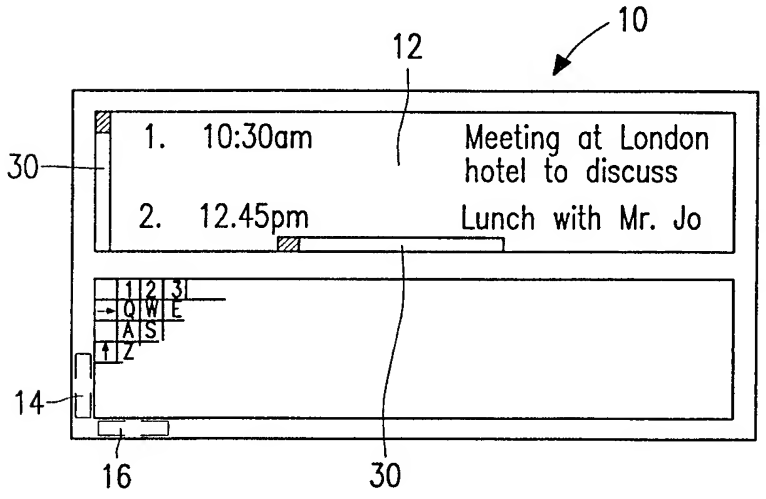

FIG. 2

PUB-NO: WO009814863A2

DOCUMENT-IDENTIFIER: WO 9814863 A2

TITLE: HAND-HELD IMAGE DISPLAY DEVICE

PUBN-DATE: April 9, 1998

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APPL-NO: IB09701139

APPL-DATE: September 22, 1997

PRIORITY-DATA: GB09620464A (October 1, 1996)

INT-CL (IPC): G06F003/14 , G06F015/02

EUR-CL (EPC): G06F015/02 , G06F001/16 , G06F003/033

ABSTRACT:

CHG DATE=19990617 STATUS=O>A hand-held image display device (10) has a display (12) and at

least one sensor (14, 16) responsive to an angle of tilt of the device (10). The tilt of the device is used to effect a scrolling function of the display (12).